Presentation to the Connecticut Legislative Task Force on Climate Change and Long Island Sound Preservation

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I am the person who sits on the …

- Board of Selectmen
- Board of Finance
- Planning and Zoning Commission
- Economic Development Commission
- Public Works Commission
- Police Commission
- Fire Commission
- Emergency Preparedness
- Transportation Planning Committee
- Pre-disaster Mitigation Planning Committee
- Standing Building Committee
- Public Health Board
- Agriculture and Fisheries
- Human Services Committee
- Conservation Commission
- Harbor Commission
- Water Pollution Control Authority
- Ya-di-ya-di-ya….

Disclaimers and Caveats

The views expressed in this presentation are the personal opinions of Sid Gale and do not represent official policy of any organization.

Photos and graphics represent hypothetical illustrations of possible future events to illuminate policy discussions, and are **not** presented as predictive or authoritative information for public or personal planning.

Objectives of this Presentation

- Address critical distinctions between repetitive storm damage and sea level rise.
- Clarify the application of responsive strategies to storm surge and sea level rise.

Recurring Themes

- Context
- Capacity to Act
- Property Rights vs. Responsibilities
- Resilience vs. Sustainability

CONTEXT

- **A Minor Detail** – Climate Change isn't the only challenge we'll have to juggle.

The Four Horsemen of the E- pocalypse

Drivers competing with Climate Change for resources and management attention.

Energy – more vulnerable, more costly, less available

The **E**lderly - pensions, social security, health care

The **E**nvironment –other issues of pollution and land / water conservation.

The **E**conomy – globalization and diminishing personal resources

Or, put another way….

Goodbye, Government, Under Either Fiscal Plan

By EDUARDO PORTER

"The contemplated cuts in discretionary spending would make the federal government little more than a heavily armed pension plan with a health insurer on the side"

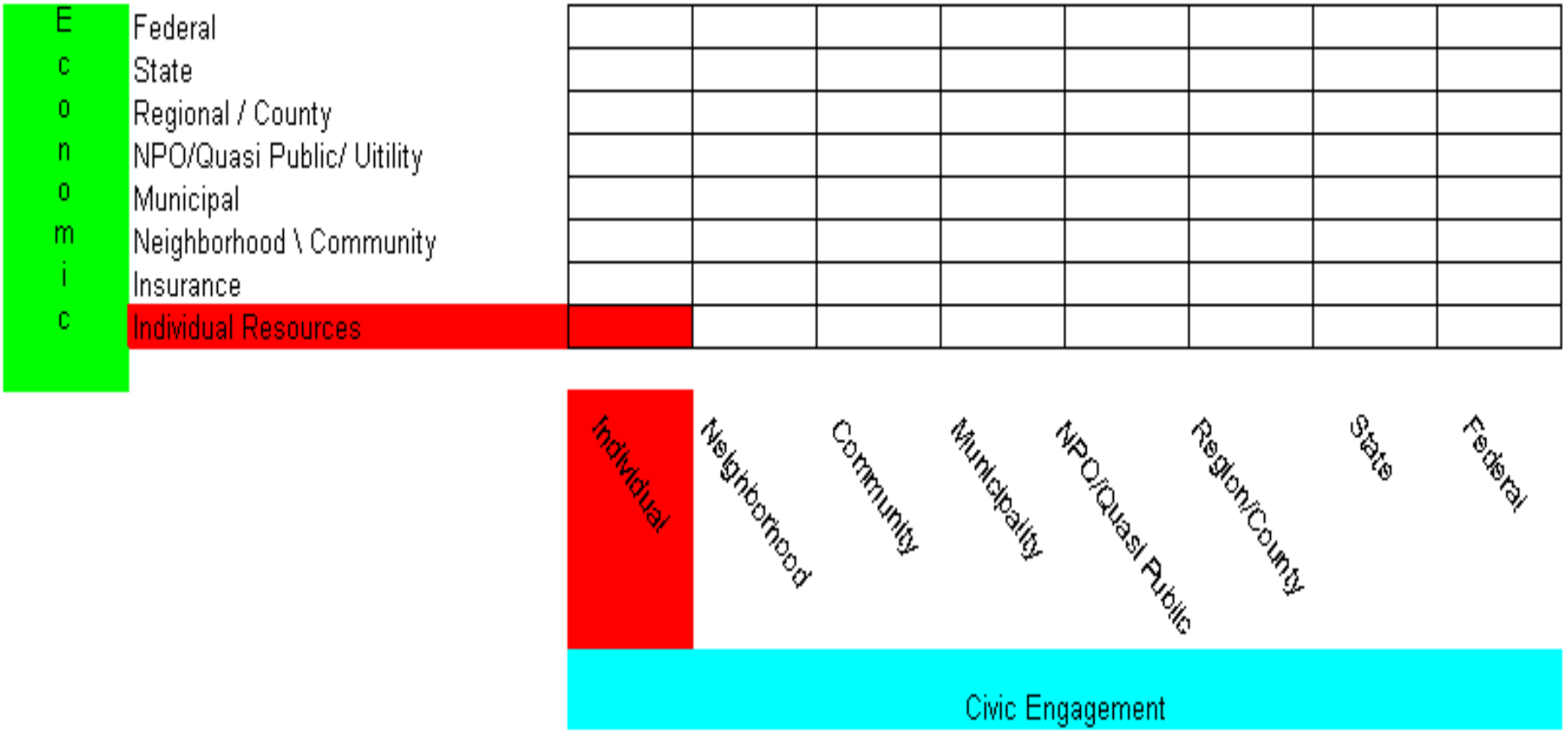
New York Times – 2012/12/19

Capacity to Act

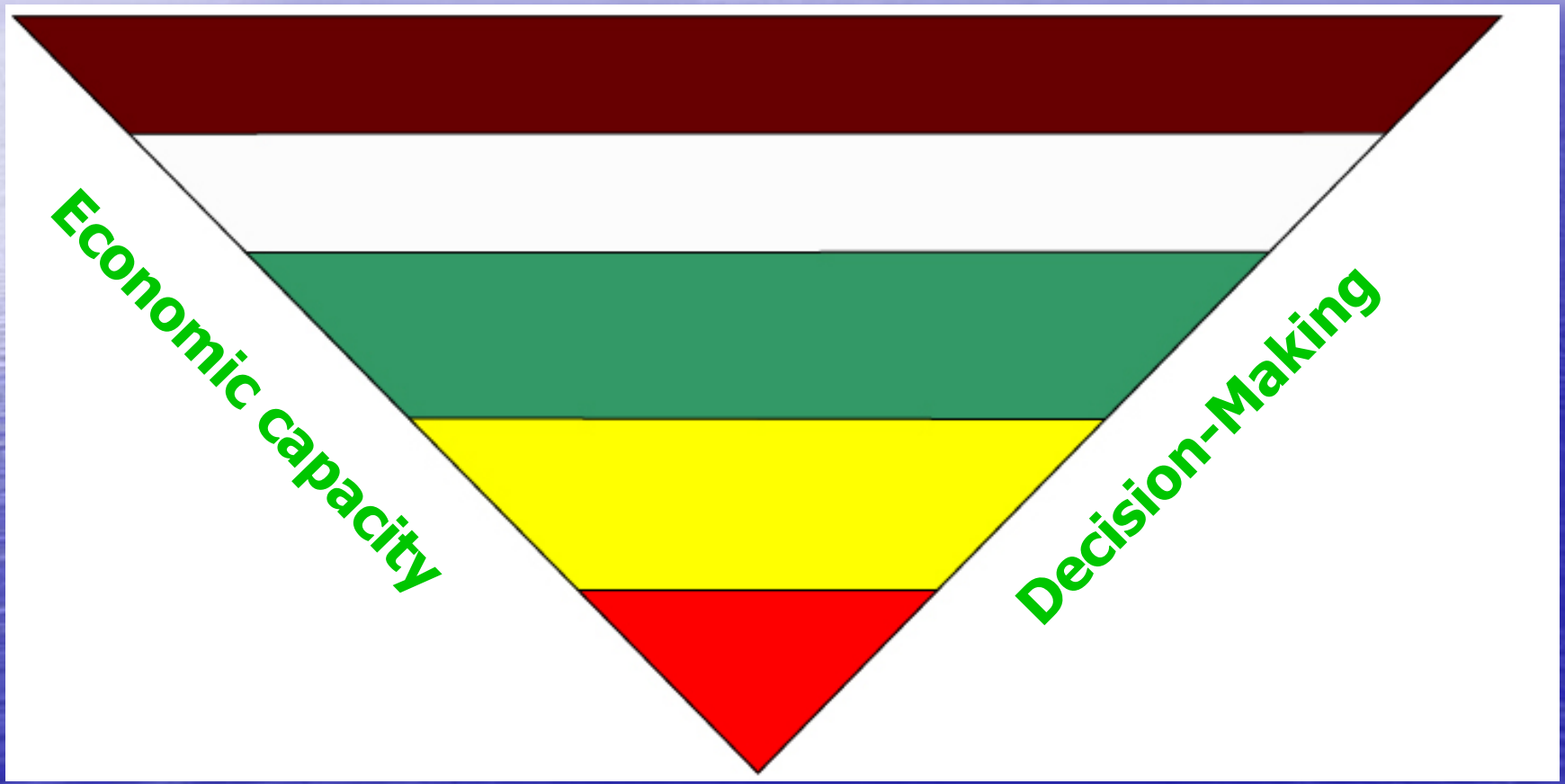
Three Dimensions

- Economic Resources (ability to pay)
- Civic Engagement and Decision -making (Governmental, Private Institutions, Citizens' willingness to pay)
- Time (doing the right things in time)

Capacity To Act



The Pyramid of Resilience and Sustainability
Ultimately – it all rests on individuals.



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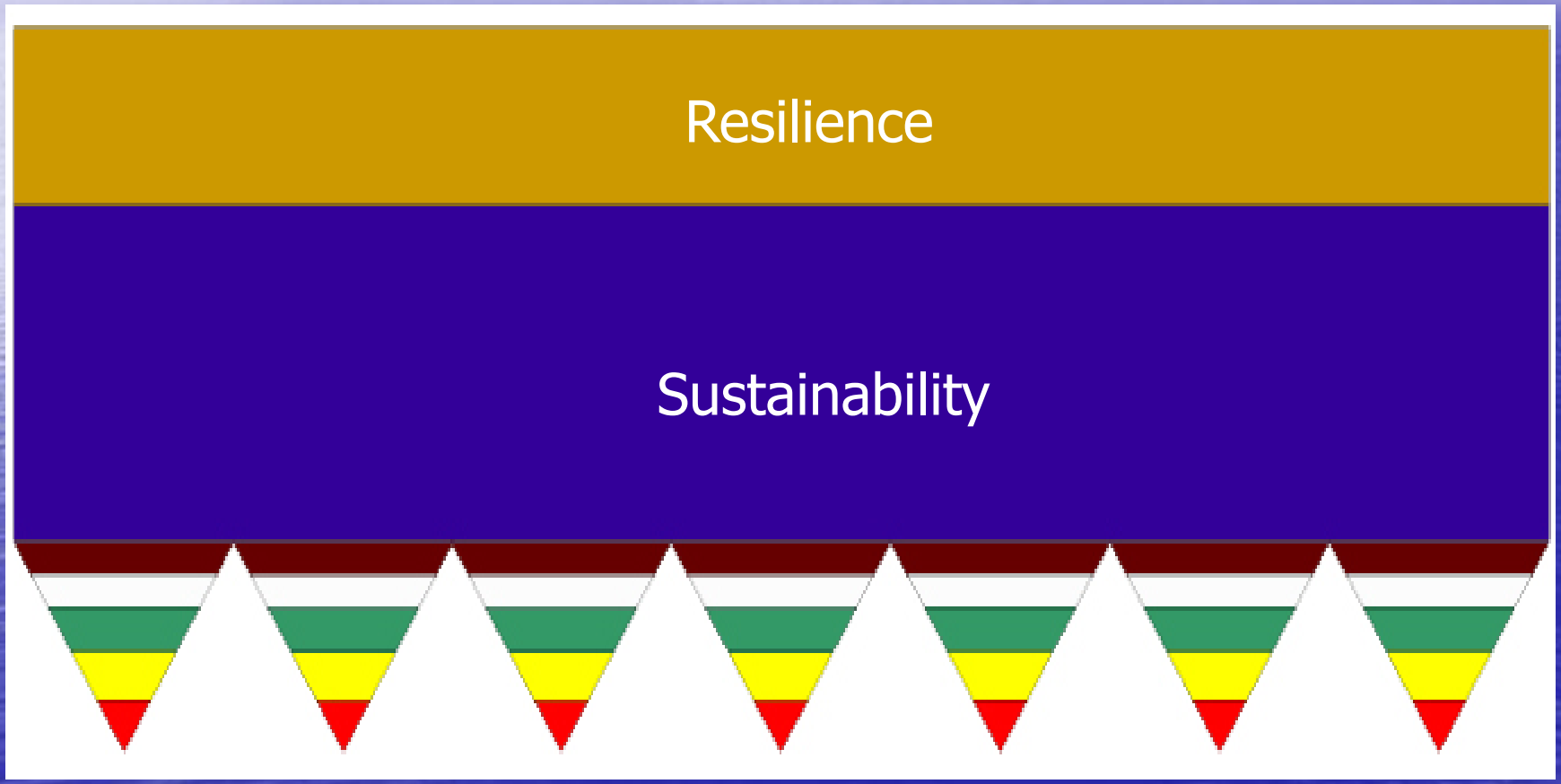


Many Demands, …One Pocket

Insurance Premiums

Taxes Fed

Taxes State

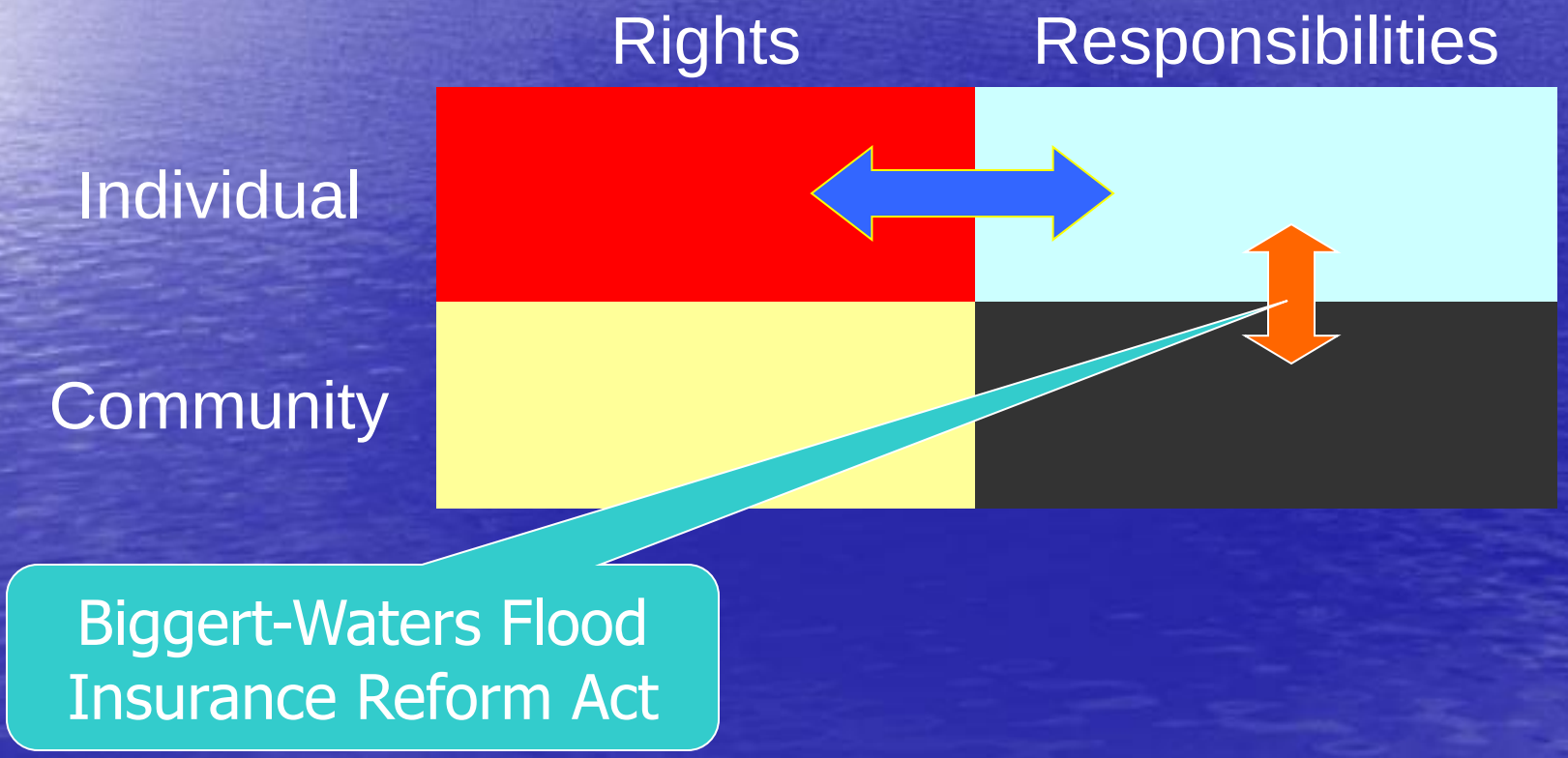
Taxes Local

Personal Reserves

Everything else

Utility Rates

Property Rights: "Balancing the Books"



Resilience and Sustainability Related but Distinct

- Resilience: the capacity to recover from adverse impacts.
- Sustainability: the capacity to maintain and preserve against adverse conditions (and hopefully prosper).
- **No amount of resilience can sustain the unsustainable.**

Hazards

- Erosion
- Storm Surge
- Sea Level Rise:
  - Plain vanilla *contained* rise (hardened, elevated shorelines)
  - Surface Inundation (soft, low-lying shorelines)
  - Sub-surface Inundation (stealth SLR)

Hazards - Erosion

- Ongoing
- Gradual
- Permanent
- Accelerated and worsened by Sea Level Rise

Hazards – Storm Surge

- High Impact
- Temporary and recurring
- Likely to worsen with sea level rise
- Likely to become more frequent with global warming (wind component)
- Insurable, maybe,…
  - but at what cost?
  - and for how long?

Darwinian Economic Displacement Rising Premiums, Falling Values

"Disaster-aid experts say that to date, flooding from heavy storms and higher storm surges on the nation's coasts has been the most expensive form of damage. In June, Obama signed a law to reform the National Flood Insurance Program by **expanding the nation's floodplain boundaries and increasing insurance premiums on homes built in floodplains by up to 20 percent annually.** That will raise insurance costs for homeowners and could lower the economic value of businesses built on that land, but it could ultimately shield taxpayers from spiking damage costs."

No Laughing Matter

By Coral Davenport **September 20, 2012, National Journal**

Hazards - Sea Level Rise
Inundation

- Gradual
- Permanent (on human time scale)
- ***Uncertainty*** as to timing, extent and resultant impact.
- Not insurable.
- Generally requires ***neighborhood strategy***, not property strategy.
- Requires a **long term**, **life cycle**, **net-present-value** assessment of cost-benefit of responsive strategies.

A Glimpse into the Future

At the 2004/11/19 workshop, Dr. Lynne Carter offered the following projections for Sea-level Rise, based on IPCC projections:

- 4-11 in. by the 2020s;

- 7-23 in. by 2050s;

- 9-42 in. by 2080s.

Probable 20 inches.

Probable 36… Maybe 48, 60, 72

Global Sea Level Rise Scenarios for US National Climate Change Assessment
NOAA Technical Report OAR CPO-1
2012/11

Table 2. Global SLR Scenarios

Scenario	SLR by 2100 (m)*	SLR by 2100 (ft)*
Highest	2.0	6.6
Intermediate-High	1.2	3.9
Intermediate-Low	0.5	1.6
Lowest	0.2	0.7

* Using mean sea level in 1992 as a starting point.

Highest probable Ice Sheet Loss

Add Limited Ice Sheet Loss

Primarily thermal expansion – AR4

Historical extrapolation

FEMA Maps and Future SLR

"FEMA is providing information about current risk **based on historic conditions**, including new ABFE maps for parts of coastal New York and New Jersey. Using the best available scientific information to address flood risk, including ABFEs, has immediate, short-term benefits to communities, but **does not account for increasing flood risk resulting from future sea level rise.** In order to reduce vulnerability and increase resilience further into the future, long-term decisions such as where to locate new developments or critical infrastructure should incorporate information on future risk, such as sea level rise projections."

Hurricane Sandy
Rebuilding Strategy *Addressing Future Risks Pg. 186 2013/08/19*

What's the difference between erosion and SLR inundation?

What's the difference between storm surge and SLR inundation?

Resilience?

Sustainability?

Hazards and Responsive Strategies

	Traditional Hazards		Sea Level Rise Inundation				
	Erosion	Storm Surge	Surface	Sub-surface			
			Property Surface	Connecting Transportation	Well Water	Septic	Other Infrastructure
Beach Replenishment	Y	Po/Pa	N	N	Po/Pa	Po/Pa	Po/Pa
Salt Marsh Maintenance/Restoration	Y	Po/Pa	N	N	N	N	N
Shoreline Hardening	Po/Pa	Po/Pa	N	Po	N	N	N
Move Back	Y	Po/Pa	N	N	N	N	N
Raise Structures	N	Y	N	Po	N	N	N
Retreat	T	T	T	T	T	T	T
Note:	1	2	3	4	4	4	4

1, When facility is at risk

2. Under conditions of repetitive loss

3. Presumes uninhabitable Condition for health or safety.

4. If one of these exists, one or more of the others may be presumed at present or in the future.

Abbreviations

Y Yes - Response addresses hazard

N No - Response does not address hazard

Po/Pa **Po**ssibly or **Pa**rtially under certain circumstances

T Terminates Exposure to hazard

Travels with Sid

Let's test out recommended responsive strategies in the real world and see how they fit.

- Natural defenses (beach replenishment and marsh protection)
- Harden
- Build up
- Build back

Mystic Village

Mystic Village –

1 Foot above annual average high tide. Not much margin left for storms,…or further sea level rise.

Mystic Village

"You can't always get what you want…" Mick Jagger, contemporary philosopher

"…and sometimes, not what you need." El Sid

New Haven homeowners, city to keep pushing Connecticut for seawall

Published: Friday, November 09, 2012

By William Kaempffer, Register Staff

wkaempffer@nhregister.com / Twitter: @kaempffer1

Old Saybrook

Westbrook

- Seasonal high tide covers a small strip of beach. Sea level rise will eventually claim this. And the sea walls next?

Build up or back?

Hammonassett Beach, Madison

Connecticut's flagship state park. Two miles of beach steadily eroding. Estimated cost of restoration in 2006? $6 to 20 mm. For 2 million visitors each year: priceless.

Hammonasset Beach State Park will be mostly inundated by sea level rise by the end of the century. (Photo Credit: CT DEEP)

CT. Climate Change Preparedness Plan, Pg 46

Strategic Retreat – A Planning Reality

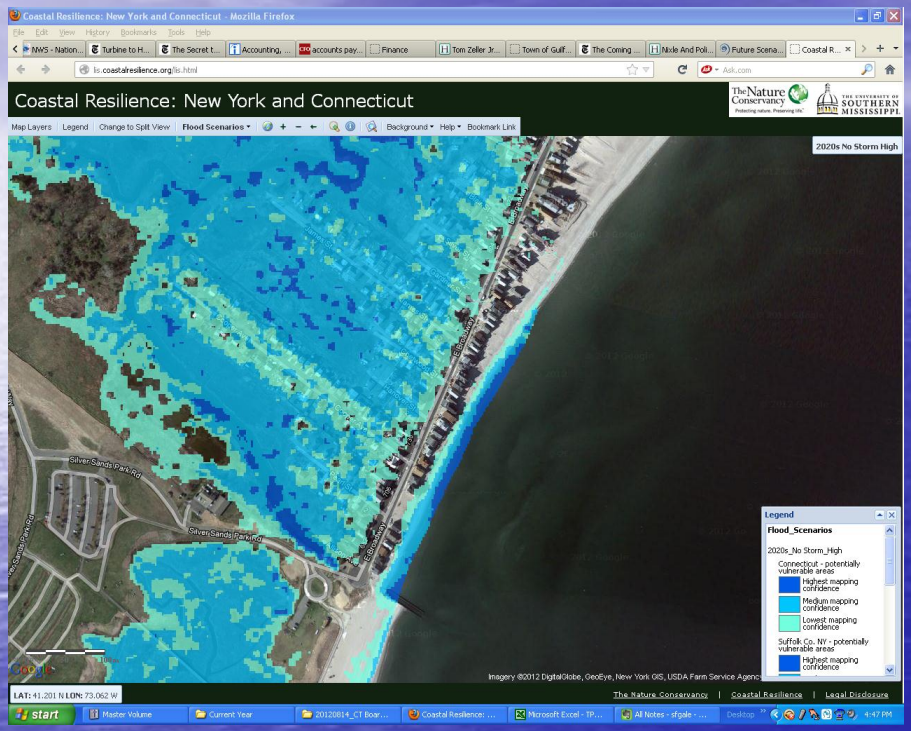
- *Note: In response to damage by Hurricane Irene, State Parks has reached the conclusion that **maintaining the shoreline at west beach is not, in the long run, sustainable.** Repairing storm damage to the bathhouse and boardwalk, while doable, leaves these structures vulnerable to continued storm impact. **Taking a "retreat" strategy** we are proposing to demolish the West Bathhouse and have initiated a project request through the Department of Construction Services to build a new facility inland, in the vicinity of the current parking lot. Additionally we are planning to relocate the westerly 400 feet of boardwalk to the inland side of the dunes, connecting it to the new west beach bathhouse. The design of and materials selected for these new projects will be matched with their vulnerability to sea level rise, ong other factors.*

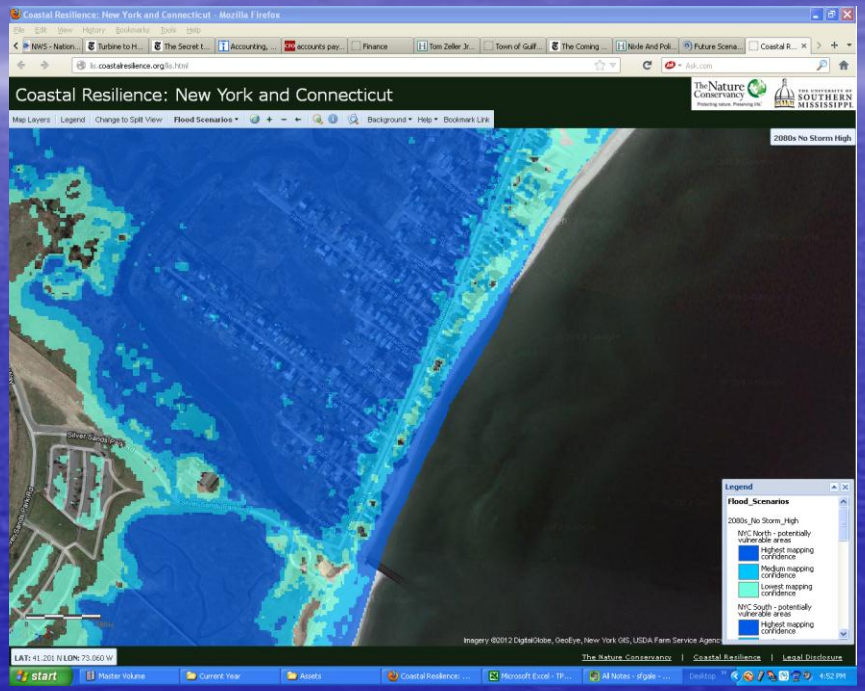
CT Climate Change Preparedness Plan Pg. 47

Beach in Strategic Retreat

When the thin strip of sand at the left no longer protects the pilings and foundations, what next?

Inundation – 2020 and 2080 High Projection





Post Sandy as of 2013/07/02

Marsh in Strategic Retreat

Salt Marsh Floods Road

Find the trampoline, find the salt marsh.

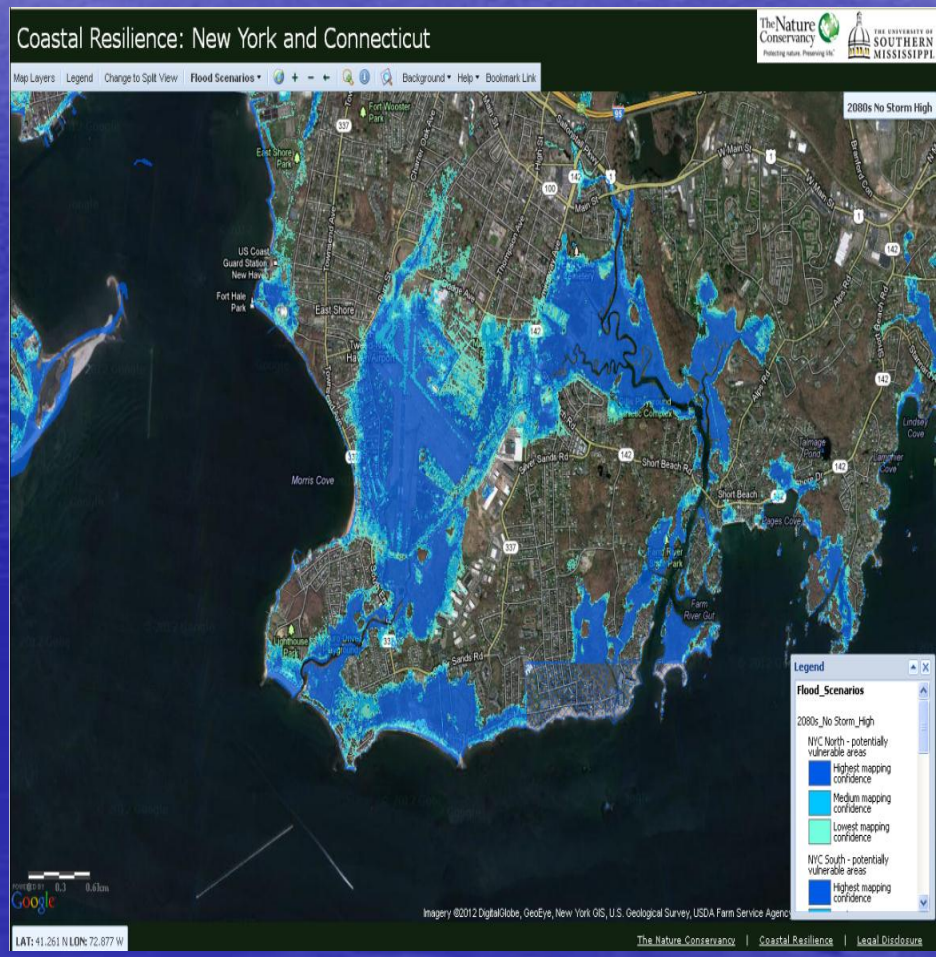
New Haven – Quinnipiac River - Fairhaven

This photo could be sea level rise in twenty to forty years… or seasonal flooding from heavy rains next spring. Not all aspects of Climate Change will give us the luxury of long range planning and adaptive response.

Small Infrastructure – Storm Drain in Reverse

Infrastructure
2030 or 2013/09/18 at 11:03 pm?

Big Infrastructure
Tweed, sooner and later –
2020 and 2080 inundation-
at higher estimate.



Impacts, Seen and Unseen

Area has high water table, compromised by abnormal high tides.

Gale's Postulate of Sea Level Rise Response

- We can do anything with enough time and money, but…

- Corollary A

  …we haven't got enough time or money to do everything, and…

- Corollary B

  …we can't save everything.

Conclusion:

Strategic retreat will be inevitable *in some cases*.

The Serenity Prayer – Climate Change Version

- Grant us the resources to protect what we can;
- …the courage to surrender what we cannot protect;
- …and the wisdom to know the difference.

So wa’ da we do?

Case Study

To Build or not To Build.

That is the **Q**uestion!

Looking from Long Island Sound landward

The shape of things to come…
…and two more just like it.

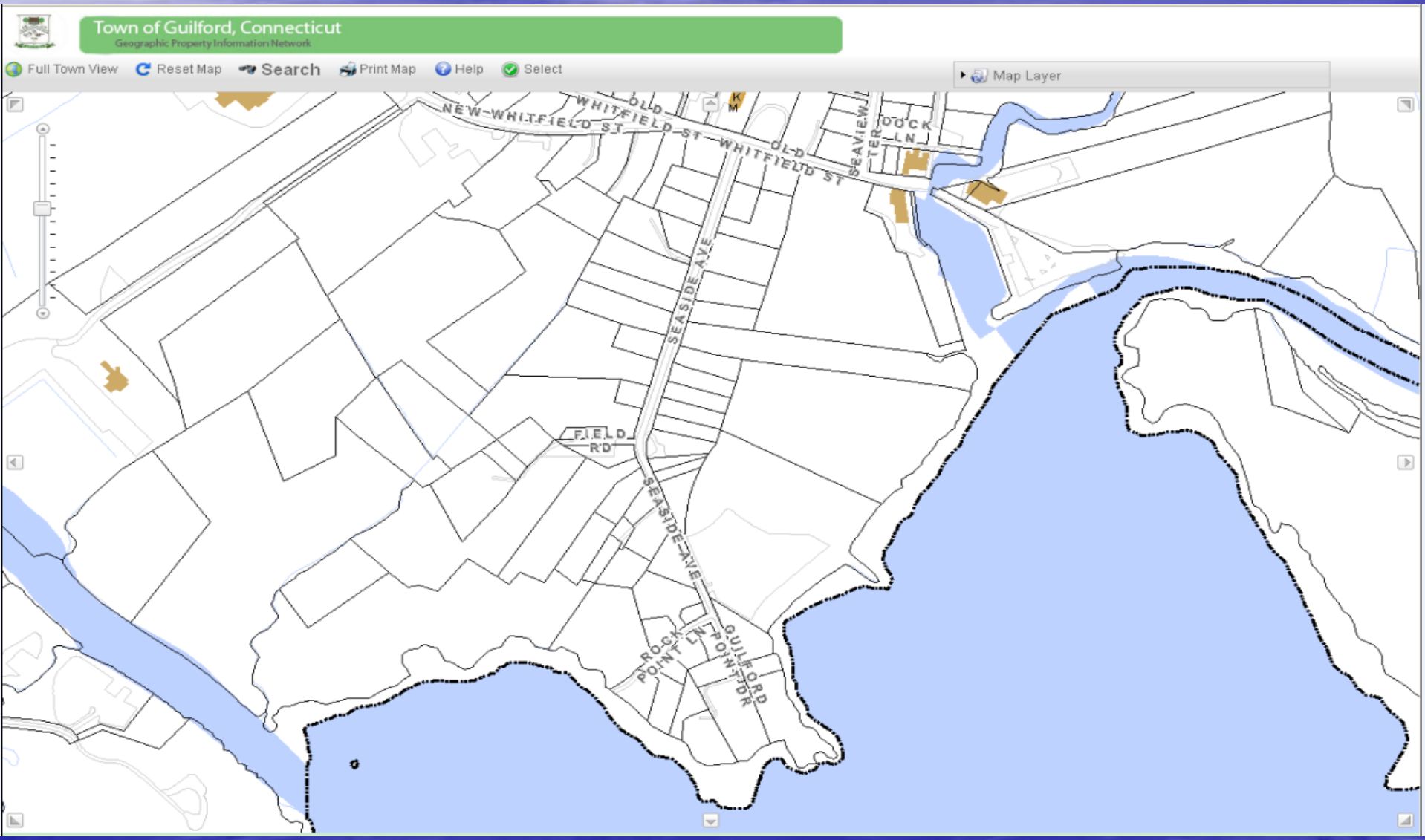
Another view

2004/12/11- looking south

It’s not just the house; it’s the neighborhood

12 hours before Sandy arrived…
…or just another robust nor'easter.

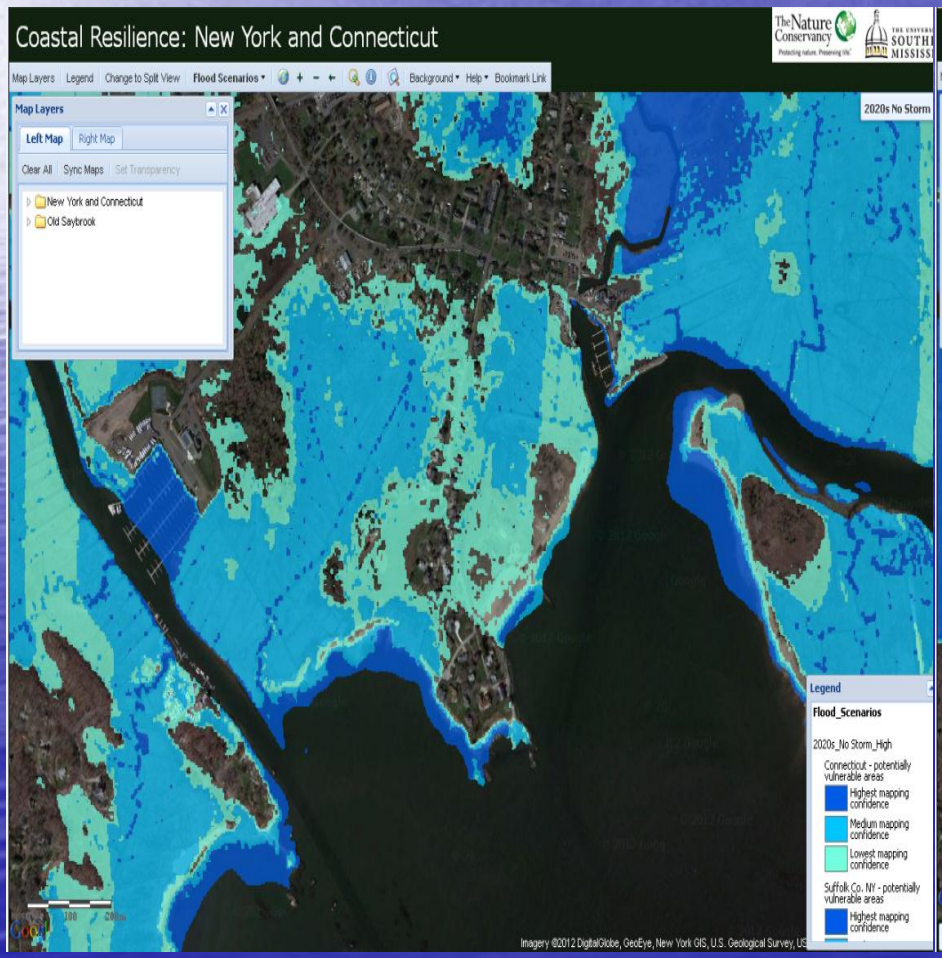
Subject neighborhood from above

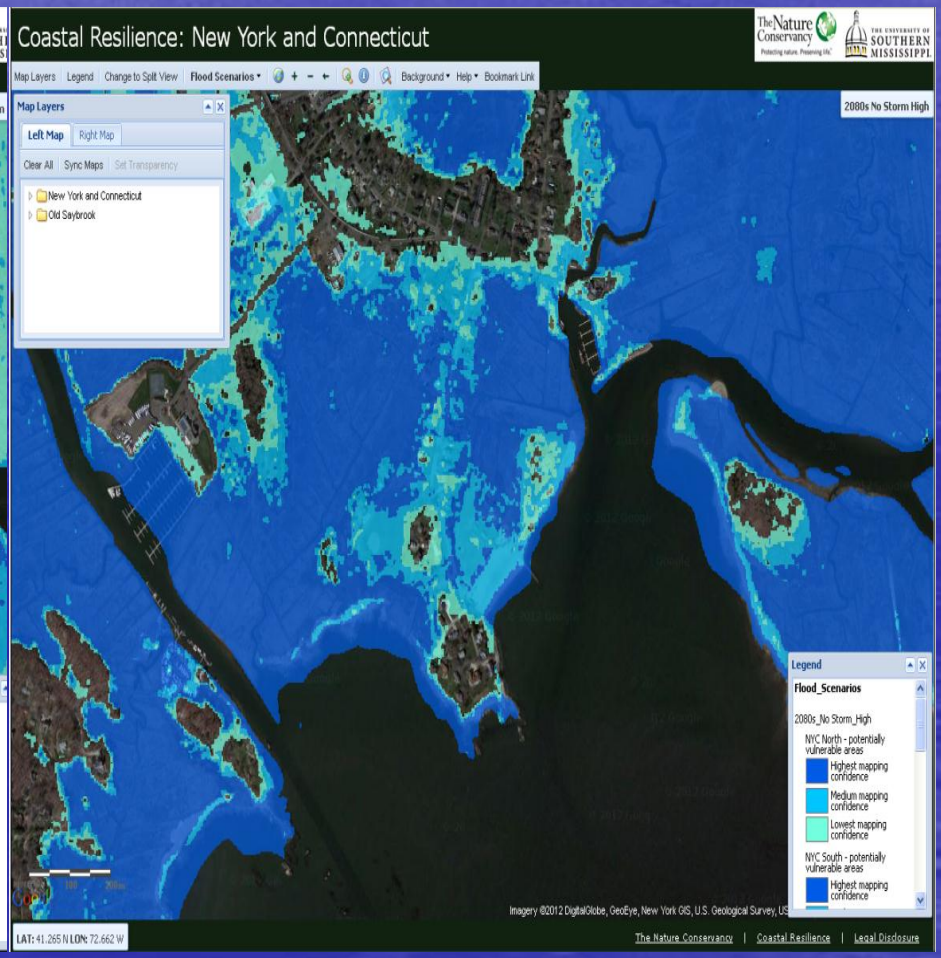


Possible Exposure to Economic Consequences of High Inundation

	Number of Dwellings	Appraised Value	Annual Tax Contribution
Value of houses that will not have surface flooding	17	$ 22,522,615	$ 338,965
Value of houses that may flood	31	$ 18,365,529	$ 276,401
Total Residences	48	$ 40,888,144	$ 615,367

Subject neighborhood – 2020 and 2080 inundation- at higher estimate.





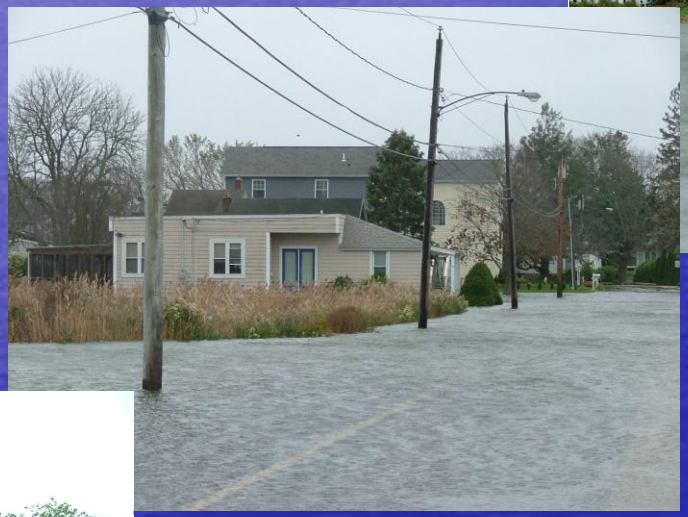
How does this scenario play out over time?

Yesterday's Scum Line…
…Tomorrows High Tide Line

Yesterday's Scum Line…
…Tomorrows High Tide Line

How does this scenario play out over time?

2100



2060?

2050?

2040?

2013

Two ends of the same street

Optimists?

Realists?

Implications of Case Study

- No property stands alone.
- No property is more secure than the shared infrastructure it depends on.
- Need to look long term at life cycle implications of current decisions.
- Social justice issues: fairness of community response
- Building to historical standards does not assure future viability.

Next Steps

- Modify 13-179 to require state and municipal planning for inundation as well as erosion.
- Require municipalities to inventory and value their at-risk private and public property and infrastructure, and report to the State and their citizens.
- Require property record disclosure of risk of repetitive storm damage or eventual inundation risk.

The Big 'Ask'

Needed:

A robust state-level monitoring and analytic resource to guide public and private decision-making.

We cannot make intelligent decisions in an information vacuum.

Comments or questions regarding this presentation may be directed to:

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